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JAVA AND THE PHILIPPINES

By Edwin Bingham Copeland,
Dean, College of Agriculture.

The following somewhat comprehensive report on the matters of particular interest which I saw or learned otherwise in Java is printed because, in considerable part, these are matters of permanent interest to the college of agriculture, and because they should furnish a basis for conclusions as to what is desirable procedure in a number of matters of interest to the Government of the Philippine Islands.

The Government of the Dutch Indies, of which the Island of Java is in every respect, except in area, decidedly the most important part, is administered by a Governor-General with the assistance of an Advisory Board known as "The Council of the Indies." The Governor-General is appointed by the Queen of the Netherlands for a period of five years. He receives what would be regarded here as an exceedingly large salary, and is a man of full experience, and chosen with especial regard to the post he is to occupy. The Dutch Government of Java and the neighboring islands has, in fundamental essentials, the same object as the Government of the Philippine Islands. The Government is distinctly for, and in the interests of, the native people, and in recent years this aim of Government has dominated all others to their practical exclusion. There was a time, as is well understood, when Java was administered in the interest of Holland. That time is so far past, that, so far as the Central Government of the Dutch Indies is concerned, nothing remains to show that it ever did exist. The Dutch Government has never made any profession of a disposition to pave the way for a native state. It does, however, devote its energies altogether to the service of what it believes to be the best interests of the native people.

The fact that the Dutch Government of the Indies pays attention to plantation crops, which are in the hands of foreigners and practically never in the hands of the natives, and that it maintains in its Department of Agriculture a separate office devoted to these plantation crops, and that it subsidizes a number of experiment stations handled in coöperation with planters' associations, does not detract in the least from the full validity of the statement that the service of the Government is the service of the natives. While I did not see a case, I heard reports, and have no doubt that it is true, that here and there through Java, there are spots where local officials still serve ideals which the Central Government has completely abandoned,—spots where attention is given to the interests of the Dutchman rather than of the native. The Government of the Dutch Indies is decidedly a big one, and even if there were not the weight of historical precedent for such procedure, it would be strange indeed if such imperfections as occur in every Government of considerable size did not occur also in Java. The Government does not always succeed in serving the people, even in a Republic. The impression which I acquired

during my visit was that, taken as a whole, the Government of the Dutch Indies is successful in a really marvellous degree in doing for the people of Java those things which will serve these people best.

The Government of the Indies is administered through eight departments, the names of which can be translated somewhat roughly as follows: Justice; Education; the Interior; Agriculture, Industry and Commerce; Finance; Public Works; War, and Marine. As happened in the Philippines, this organization was a growth, and some of its features seem rather anomalous in a finished structure. For instance, Health is included under Education. Regarding the school work of the Department of Education, I am sorry to say that I have very little information of value. The Central Office of this department is in Batavia, and I was too busy in Buitenzorg to spend the office hours of any day in Batavia. Batavia is nominally the capital of the Dutch Indies, and the majority of the departments have their central offices there. The Governor-General, however, lives in Buitenzorg, and visits Batavia only when business demands. The Department of Agriculture, Industry and Commerce, in the work of which I was of course most interested, has also its central offices and laboratories and central experiment stations in and near Buitenzorg. It is also to be noted that not merely agricultural education, but all technical school work, except for the School of Medicine in Batavia, is under the Department of Agriculture, etc. The Department of Agriculture, Industry and Commerce, as a department, is decidedly a new one, having been organized by Doctor Melchior Treub, who had previously been Director of the Botanic Garden, and was one of the world's leading botanists. The family is a distinguished one in Holland, and a brother of Doctor Melchior Treub is at present the Premier of that country. The present Director of this department, Dr. H. J. Lovink, is the second to hold the position. Before his appointment, he had achieved distinction in Holland in the establishment and supervision of a system of agricultural education. It is, therefore, not surprising that the educational work of the department receives a great deal of attention under his directorship. The budget of the department for 1914 amounted to f12,286,709. The Dutch florin is approximately 40 cents U. S. currency. The budget of this department is therefore a little less than ten million pesos.

The administrative policy of the department has been one of effective decentralization. It is my opinion that this has gone materially farther than is, in the long run, desirable. Decentralization is consistent with thorough efficiency if the head of the department is strong enough to handle a complicated machine. Dr. Treub and Dr. Lovink have been able to do this as was indeed to be expected since they are the men who have carried out the policy, and since they naturally have had intimate and personal association with the various offices which they have created. Dr. Lovink has held his position for nearly eight years, and the department is, I believe, only about twelve years old. I am of the opinion that, whenever it becomes necessary for a new man to become Director of the department, such complete decentralization will prove a disadvantage, and a closer organization would produce better results. In some of the higher educational work, this seems to me to be fairly true at the present time. A government should not depend too entirely on the personal qualifications of its administrative officials. The best machine makes the least demands upon its engineers.

The department includes the following divisions:

1. The Bureau of the Department, including Administration, the Library, and the Reproduction and Printing Offices.

2. The Botanical Garden. This was the original core of the department, and many of the present divisions of the department are doing work which was comprehended under that of the Botanic Garden, when Dr. Treub was its Director. The present work of the Botanic Garden is considered to be restricted to pure science.

   (a) Botanic Gardens. Of these, there are three.

   (b) The Herbarium and Botanical Museum.

   (c) Zoological Museum and Laboratory for Faunistic Zoölogy.

   (d) The Pharmaceutical and Phytochemical Laboratory.

   (e) The Botanical Laboratories at both Buitenzorg and Tjibodas, including the Treub-Laboratory, a fine establishment designed entirely as a place for foreigners to work during visits at Buitenzorg, and at present unoccupied as a result of the European War.

3. Division for Practical Ichthyology. This is located at Batavia, and does work of very great economic importance in Java.

4. Inspection of the Agriculture of the Natives. At present, this office does the statistical work on the agriculture of the Dutch Indies, and is entrusted with the cotton industry.

5. Agricultural Instruction. This falls under three heads:

(a) The direct instruction of the natives at many places both in schools and on the farm, and inspection of this kind of work.
(b) The Culture School at Soekaboemi.
(c) The Agricultural College at Buitenzorg.

Concerning all three of these, I shall have much more to say.

6. The Veterinary Institute, which includes the Veterinary Laboratory and the Veterinary College, both located in Buitenzorg.

7. The Veterinary Service. This includes a head with the title of Inspector, 2 Sub-Inspectors, 40 Dutch Veterinary Surgeons, and 8 Native Veterinary Surgeons.

8. The institute for Phytopathology and Plant Breeding. To this also I will return at length.

9. An office which has no title, but which occupies itself with Agrogeology and Agricultural Chemistry, and includes also an Irrigation Laboratory, and a "Laboratory of Microbiology" which at present is occupied entirely with Rubber Chemistry.

10. The Selection and Seed Distribution of Rice and Other Annual Crops. To this also I will return in connection with the Institute for Phytopathology and Plant Breeding.

11. The Division of Industry and Commerce. This division includes three minor divisions:

(a) The Bureau of the Division, which is the Administrative Office.
(b) A laboratory for Commercial and Industrial Chemistry.
(c) A museum for Commercial and Industrial Botany.

The separation of the laboratory for Commercial and Industrial Chemistry, and of the museum for Commercial and industrial Botany from the corresponding laboratory and museum maintained and administered by the Botanic Garden, seems to me to be of exceedingly doubtful propriety. If both organizations do exactly what is expected of them, the work in the Botanic Garden will be of such remote actual value that in time of stress, it can hardly hope to secure such support as will let its work be continuous and properly effective. As a matter of fact, I do not think that the offices in question in the Botanic Garden do keep way from the field of the Division of Industry and Commerce, but so far as I can learn, no friction or duplication has occurred up to the present time as a result of having more than one office doing the same kind of work.

12. Forestry. This is, in a business sense, decidedly the greatest of the divisions of the department.

13. The Inspection of the Government Coffee Culture. The Government Coffee Culture was at one time of very great importance, but this office is now a minor one and its functions are chiefly of a business nature.

14. The Government Estates of Gutta percha and Rubber. This also is an administrative, business division, and investigational work is being done by other offices.

15. The Rubber Estates of the Forestry Department. This office was created, if I am correctly informed, practically as a relief for the Forestry office.

16. The Government Cinchona Estate near Bandoeng.

Beside these sixteen administratively coordinate offices of the department, there are also a number of experiment stations. Two of these, the experiment station for tea at Buitenzorg and the experiment station for tobacco at Klaten, are in very close relation with the department, but are in considerable part supported by funds contributed by planters or planters' associations. There are also three experiment stations in loose relation with the department. These are the experiment station at Salatiga, devoted to local work on coffee, cacao, kapok, pepper, etc.; the experiment station at Malang, occupied chiefly with coffee and rubber; and the experiment station at Djember, occupied chiefly with tobacco and rubber. These stations, as I understand them, are subsidized by the department, but administered by local boards. There are also two experiment stations which have no official relation with the Government, the sugar cane station at Pasoeroean, which has six sub-stations, and the Deli tobacco experiment station at Medan, Sumatra. While these are not officially connected with the Government, the Department takes care to work in cooperation with them to such an extent that there shall on neither side be any essential duplication of effort.

As a result of the existence of these experiment stations, closely related, loosely related, and without official relation with the department, the

department itself leaves certain very important crops practically untouched, so far as its own offices are concerned. This is most conspicuously true of sugar, but is very noticeable of tobacco also. These are crops of tremendous importance in Javan industry, but are largely in the hands of foreigners who operate plantations on a large scale, and who are united into associations. The experiment stations and laboratories maintained by these associations, I was unfortunately unable to visit, but I know from reports that they are models of their kind. The sugar cane experiment station at Pasoeroean has, beside its Director, about 20 technically trained assistants. In its work, it seems to be closely comparable with the sugar planters' experiment station in Honolulu. Another station of the same kind has recently been established by sugar planters in Porto Rico.

Turning now to the various entities which make up the Department of Agriculture, Industry and Commerce, I will explain, as far as it is likely to be of local interest, what I learned about the equipment and work of those which most interested me.

The Bureau of Forestry, as already noted, is, in its financial aspects, the most important of these divisions. Its income and its expenditures have increased steadily for a number of years, in fact without interruption as far as statistics are available to me. The technical staff consists of a Head Inspector, six Inspectors, sixty-seven Foresters, thirteen "aspirante" Foresters, who are, in effect, junior foresters, and twelve Assistant Foresters. Beside this educated technical staff, there is an exceedingly large force of foremen, guards, rangers, etc. The Forestry Office spends annually from five to six million guilders, and its income is almost three million guilders in excess of its expenses. The force is, in every large part, employed on the Island of Java. On the other larger islands of the Dutch Indies, forestry is, on the whole, less developed than in the Philippines, and the force of the bureau employed on those islands is very small.

In Java, the primitive forest, except at rather high altitudes, has almost entirely given way to cultivation. For many miles around Buitenzorg, if one looks over it, the country has very much the appearance of a land largely in woods, but as a matter of fact, I did not see on any of the trips I took through this country, a single tree of considerable size which had not been planted in its place. There were very many fruit trees of a large variety of kinds, but without exception, standing as cultivated crops; and waste land, even on the banks of gulches, simply does not exist. Even on the mountains of Java, the forest has given way on the lower slopes to rice, coffee, more recently tea, and various other crops, and on the higher slopes, even at an altitude considerably above that at which water is available to irrigation, tea has been very extensively planted and the forest has had to make way for it. I went entirely around the Gedeh mountain mass, and would say that roughly, the lower limit of forest is above 4500 feet, and that in places there are very extensive tea plantations which carry the forest limit materially higher still. While Java is a conspicuously mountainous island, the mountains are isolated from one another, and there is no great plateau area above the limits of cultivation. The result is that the natural forest of Java occupies an altogether insignificant area, and that the products of the natural forests are of practically no economic importance whatever. Of the family Dipterocarpaceae, for instance, which compose the great bulk of the commercial forests of the Philippines, I did not see one tree in Java except those in the Botanic Garden at Buitenzorg. The large income of the Forest Service is derived then almost altogether from forests which are not merely under control, but are composed of trees planted by hand, and afterward attended to with a care which is unfortunately often wanting in orchards and coconut groves in the Philippines. The crop is always teak. The teak forests of Java occupy approximately 700,000 hektares. The country where teak is planted originally contained teak and a mixture of other trees in a state of nature, and as it has been lumbered off, teak, in pure stand, has been systematically planted in its place. There was a time when these teak plantations were seriously damaged by fire. The cultural system of Java does not permit damage of this kind to continue indefinitely, and after various attempts to handle the fire problem in other ways, recourse was had to planting, with the teak, trees which would keep the ground in such condition that the spread of fire should be impossible. For this purpose, it was natural that leguminous plants should be chosen in order that the ground could be enriched at the same time that it is protected. The first choice for this work was formerly given to a species of Indigofera. About six years ago, Leucaena glauca, the Ipil-ipil of the Philippines, was tested extensively for this purpose, and proved so superior to any other plant that, except on very low-lying ground where Indigofera thrives better, the use of Leucaena glauca is now uni-

versal in the teak forests. It is interesting to note that the procedure adopted on this very extensive scale in Java is the same which has been demonstrated by the Forestry Department of this College to be best on the small scale on which we are working here. The teak and Leucaena glauca are planted at the same time on land which is made clean enough for any agricultural crop. Both are rapid growers as soon as they get started. The Leucaena sometimes grows somewhat more rapidly at first, and is planted thickly enough to shade the ground completely and make the growth of grass or weeds impossible. Grass is practically unknown now in the Javan teak forests, and with its elimination, all danger from fire in young plantings has disappeared. In the best situations, the teak reaches a height of 10 meters in two years. The Leucaena is pollarded when it reaches a diameter of about 5 centimeters, and the stems and foliage cut down are permitted to decay upon the ground. It grows again from the stumps, and in this way continues to shelter the ground very perfectly. Teak is not planted in the very wet western part of Java, and in the drier region which is devoted to it, it would not, during the drier seasons, itself shade the ground completely enough to eliminate the possibility of the spread of fire when the ground is thickly covered with its dry leaves.

I have personally been for many years of the opinion that the economic condition of these islands, the abundance of natural forest wealth, and the vast areas of waste land, taken altogether, do not furnish a sufficient reason for considering that artificial reforestation is inexpedient here. On the other hand, I have been and am of the opinion that there is much land in the Philippines which will not be used for very many years for agricultural purposes and which might be reforested with the result that floods and grasshopper epidemics would be checked, the dry season flow of streams increased, and that, beside these advantages, the forest planting could itself be made to pay a profit. I have accordingly been very pleased to see that in Java, where land is decidedly more valuable than in the Philippines, it is considered expedient to plant large areas artificially, and to give them careful attention, and that this work is a source of material net income to the Government. There is incidentally another far reaching economic advantage resulting from the extensive planting of teak. This is that teak has become the almost universal structural timber of the island, and that, in this way, the tremendous annual loss in the Philippines due to the use of lumber which cannot withstand the attacks of termites and fungi is almost unknown in Java. It may be added that teak is sold by the Government at a price so low that this general use of teak for purposes for which, in the Philippines, first group lumber is considered too expensive, is obviously practicable because it is universally practised.

Taking up next the Botanic Garden. The budget of the Botanic Garden is, I believe, roughly 400,000 guilders a year. To offset this, there is practically no income from this office. With regard to the Botanic Garden itself, volumes have been written, and it will be futile for me to attempt in a report of this kind to give any idea of its unique merit. It is generally regarded as being without a peer in the world. It is almost a hundred years since its establishment, and during its first two decades, it was fortunately in the hands of excellent botanists and administrators. There were accordingly planted at that time a very large number of trees which were distributed according to a sort of systematic arrangement, but with attention at the same time to landscape architecture so that the garden now is the product of one hundred years of growth by a splendidly established foundation. It is in its trees particularly that the Buitenzorg Garden excels all others, and I am quite sure that there is nowhere else in the world a comparable exhibit of adult specimens of any such number of important trees. There is indeed congestion in spite of the fact that the garden covers a large area. This area has recently been extended by two additions, and on these, the visitor can get an idea of the steps which were necessary for the production of the older part of the garden. Since no amount of support and no display of intelligence can possibly produce such a result without the use of very many years, it is plain that if such an establishment is desired in the Philippines, the beginning should be made as early as possible.

The tree groups of conspicuous economic importance are particularly well represented in the Buitenzorg Garden. Thus, as has already been noted, there is a good collection of Dipterocarps, although these trees do not exist now native anywhere in the country about Buitenzorg. There is a very full representation of the species of the genus Garcinia which includes the mangosteen, gamboge, and a number of other trees which have recently received careful attention at the hands of the United States Department of Agriculture. There is a fine collection

of Nephelium in which genus are the lichee of China and the rambotan and a number of related fruits of the East Indies. Thanks to the courtesy of the Buitenzorg Garden, we have many seedlings of these plants now growing at the College of Agriculture. In one section of the garden, there is a collection of bamboos better than I have ever heard of anywhere else. While the house construction of the common people of Java is materially more substantial than that of the usual Filipino, and for this reason bamboo is not in use in Java as a structural material to the same extent as here, it is nevertheless important in Java, and is made to serve some purposes for which it would here be regarded as entirely unfitted. For instance, the roofs of the little houses of the villagers are very generally of tile, and this tile is almost always laid on a framework of bamboo. The bamboo is very slender and light, but so straight that nobody used to bamboo construction in the Philippines would dream that these roofs are built on a bamboo structure until he gets beneath and proves that it is the fact. The culture of very numerous varieties of bamboo in the Buitenzorg Garden has made it possible to find for each economic purpose the particular kind which is best suited, and then to distribute this kind and find a place for it in cultivation.

While the Botanic Garden itself is now regarded as devoted to pure science or, at any rate, is assumed not to go beyond the demands of beauty for it certainly does an exceedingly important service in the development of plants with horticultural value, and in their distribution, it is still to be remembered that, in the history of the development of agriculture in Java, it has had the central and foremost place, and that the various other offices in Buitenzorg to which the work with different economic plants is now assigned are the children of the Botanic Garden itself, and are merely carrying forward work which the Botanic Garden had firmly established before the present policy of decentralization was undertaken. It is also worthy of note that with the segregation of these various offices of more direct economic value, the Botanic Garden itself has lost none of its prestige, as is amply shown by the financial support which the Government continues to devote to it.

Of the two other Botanic Gardens which have been mentioned as under the same office, one is in Northern Sumatra, and I know nothing about it. The other is the Mountain Garden at Tjibodas. This, like the central garden in Buitenzorg, is a favorite resort of visiting scientists. It also however, during its comparatively short existence, has been the site of considerable work of economic value. As a matter of particular interest here, it may be noted that a very large number of forest trees were identified, marked and measured both as to diameter and height nearly twenty-five years ago. The material is therefore at hand for a remeasurement and calculation of the rate of growth, making such a piece of work as the admirable one recently finished by Dr. Brown and Mr. Matthews, but with the advantage that the period covered is very much longer, and that the variety of trees marked is, I believe, considerably greater.

The herbarium has had a more checkered career than the Botanic Garden itself, and stands very far behind it as a scientific and practical achievement. The original reason for this goes back to the days when the interests of Holland were paramount in Java, with the result that the old collections were transferred to Holland instead of being kept in Java. The result is that these collections are somewhat scattered, and that none of them are in a place where they have anything like the value which they would have if well preserved in Buitenzorg itself. As the proposition of moving the herbarium of this Government to the United States has been heard of ever since its first establishment, and is believed to have been considered even during the past year, I would respectfully call the attention of the Government of the Philippine Islands to the fact that the transfer of the earlier Javanese collections to Holland has resulted umistakably in the detriment of the progress of systematic botany. This assumes of course that when the collections are kept in the tropics, they will be given such care as is necessary here in order that they may be preserved. If this care can be assured, I do not consider it open to the slightest doubt that the herbarium of this Government is worth more in the Philippines than it can ever possibly be worth anywhere else in the world. Inasmuch as the interest of science is the only conceivable one which could be adduced in favor of transferring the herbarium from these islands, it seems to me that the idea of moving it to the United States should be permitted to die and stay dead. To return to the Buitenzorg herbarium, I would size the situation up by saying that whether or not it is larger than the herbarium in Manila is at this time, it is by no means in as good a condition for botanical research, and that, after visiting it, I am not surprised that the Manila staff of botanists, although most of the time a smaller one than that in Buitenzorg, has been contributing materially more rapidly to the

knowledge of the systematic botany of the field it covers.

The zoölogical museum is the product of quite recent activity, having been built up from almost nothing by Dr. Koningsberger. As the work of a brief term of years, it is a really phenomenal achievement. The collections of the animals of the Dutch Indies, and particularly of the higher animals, are amazingly complete, and although I have been somewhat interested in Malayan zoölogy and have from time to time read various books on the subject, nothing but the visit to this museum has given me any idea of the wealth of higher animals which are to be found in the Dutch Indies. While the mammals, birds, fishes and reptiles, and, I believe, the mollusks also are represented in this museum with remarkable completeness and by remarkably fine specimens, entomology is backward in its development. This is very possibly another fruit of the decentralization policy. The insect collection is small, exceedingly so in comparison with the other collections, and the most of the attention the insects receive seems to be given to the showy groups, such as Papilio and Ornithoptera. To me, it was very significant that, while every other department of zoölogy, except perhaps Ichthyology, is more developed in Buitenzorg than in Manila, entomology is backward, and it is my impression that the collection of insects in the zoölogical museum and the other collection in the institute for phytopathology, taken altogether, do not approach in size or value the collection which existed in the Bureau of Science at the time Mr. Banks was transferred to this college. The separation of pure science and applied science under the auspices of a government is not practicable. It is not merely that one of them will suffer, but the more important fact is that one cannot suffer without the other's doing so.

The pharmaceutical and phytochemical laboratory is in the hands of a botanist distinguished for his work in this field, and the office has in the past turned out a great deal of very valuable work. At present, it is comparatively inactive because without an adequate staff. The head of the office, Dr. Boorsma, is also head of the Agricultural College, and the administrative work of the college makes the active prosecution of his work in the laboratory impossible. The situation is in essentials like that of the botanical department of eeour own college. I do not think, and Dr. Boorsma does not think, that it can be in the interest of the Government to sacrifice a technically trained specialist for administrative work which, for the most part, requires practically no technical training.

The botanical laboratories are likewise at present not conspicuously active. Very many eminent European botanists, especially from Germany and Austria have come to Buitenzorg for work, but the war has, for the present, made such visits impossible. The visits of these botanists have both directly and indirectly been of great value to science in Java. This is not so much because their papers have usually been published in the Annals of the Buitenzorg Garden, and in this way have brought great prestige to the garden; prestige in itself is of rather doubtful value unless a way is found to utilize it. To some extent, it is utilized by the fame of the garden which causes its assistance to be sought after by other institutions undertaking to do similar work. For instance, we at this college have turned to the Buitenzorg Garden before any other place for help in establishing cultures of plants not already in the Philippines, and of choice varieties of plants which were already here, and in return, we are of course ready at all times to give the Buitenzorg Garden first choice at anything which we are able to distribute. In this way, the Buitenzorg Garden is practically in a position to get plants of economic value from any part of the world more readily than could an institution without the prestige which it has earned. Directly, the visiting scientists have made themselves serviceable to Javan interests by conducting pieces of research of direct applicability to Javanese industry. For instance, Professor Wiesner of Vienna has made several visits to Java and has made a very careful study of the Buitenzorg climate in comparison with that of other points, including Ceylon, Cairo and Vienna, and such a knowledge of local climate, in its relation to vegetation, as he has obtained and published, is of basic value in the scientific development of agriculture.

But the greatest service of all which numerous visiting scientists have rendered to science, pure and applied, in Java, has been by the inspiration which the succession of visitors has given to the local workers in Buitenzorg itself. A scientist working by himself, far away from others interested and engaged in the same kind of work, almost inevitably becomes stale, and, with or without his realizing it, is sure from year to year to become less effective. This disadvantage is felt keenly by the scientists on the Pacific Coast of the United States. If it is true there, how much more must it be true of men separated by oceans from their Fachgenossen, men trying to work as botanists who, from year's end to year's end, have no opportunity to discuss with others engaged on the

same problem the work which, from day to day, interests them? There have been such a succession of eminent visitors to the Buitenzorg Garden that this disadvantage is reduced to practically nothing. The same thing is true of the Botanical Garden in Ceylon which catches the visitors to Buitenzorg as they go and come, and incidentally, because on a main route of the world's commerce, catches some traveling scientists who make the mistake of missing Buitenzorg. In the Philippines, we are not on a route of commerce, and in most departments of science, practically never see a visitor. It is in my opinion exceedingly important that the facilities for botanical study in these islands be developed and made available in the fullest measure possible, and this is one of the important reasons which has made me advocate the transfer from Manila to Los Baños of all botanical activity which is not specifically necessary for educational work in other lines in Manila. No visitor will come to the Philippines for the sake of the herbarium and library. There are bigger herbaria and bigger libraries in many places in Europe and the United States. If he comes to the Philippines, it will be for the sake of working with living plants. Manila is so poor a place for this that the staff of the Bureau of Science themselves move out before they get busy. On the other hand, while we have at Los Baños all natural facilities which could attract visitors, we have not the herbarium and the library which are indispensable for their doing work which will be satisfactory to themselves. So long as we divide our attractions and equipment and facilities, there is every reason why the investigator who desires to work in the tropics should go to Buitenzorg or Singapore or Colombo, and should waste no time at all in the Philippines. And while this continues, we lose the gratuitous services of the visitors whom we might attract, and lose the more important inspiration and direct assistance which would come to our local botanical staff from the mere presence of visiting colleagues.

Concerning the Division for Practical Ichthyology, I know nothing of its official work except that I was told a number of times that its service is of great practical importance. I did, however, in my brief visit to the Western Preanger encounter a fish business which is unique in my experience. I saw many packers on the country roads carrying water-tight baskets which were, in every case, said to contain gold fish. The small gold fish are "planted" (this is the local expression), sometimes in small ponds especially for the purpose, but very often also in the well flooded rice paddies. The fish are an important part of the produce from these very wet paddies, and this meat is in turn an important part of the diet of the people.

It must be remembered that the population of Java is almost entirely Mahometan. The effect of this is not merely to exclude the pig from the island, but also to restrict to a very great degree the use of the meat of all other quadrupeds. Mahometan law sanctions the use of beef, mutton, etc., when the animals have been killed with the proper rites, but because of this restriction, and because the livestock of Java is, for other reasons, exceedingly limited, the Javanese people use practically no meat except that of fish and fowl. For some reason which I do not understand, fowl seem to be less abundant in Java than in the Philippines. On the other hand, as already stated, the production of fish is an organized and very widespread industry. So far as I could learn, the fish industrially taken care of, at least in the interior of the island, is always the gold fish. Near the Poentjak pass, at an altitude of nearly five thousand feet, I found that the highest running water was used to supply ponds instead of rice paddies. These ponds apparently serve solely as places for the culture of the gold fish. In other places, ponds from 1 to 3 or 4 meters in diameter were constantly found by the housee of the villagers, or in part even under these houses.

The work of the Government with crops, except for its assignment to local experiment stations, and leaving out of account also the cotton industry which is not of very great importance, is entrusted to two offices: the Institute for Phytopathology and Plant Breeding, which, aside from serving these general ends, has the specific function of attending to crops of plantation importance; and second, the office for Selection and Breeding of Rice and other annual crops, which serves the agriculture of the Javanese natives, each cultivating usually a very small area. The real distinction is not so much between perennial and annual crops as between the two quite distinct clienteles. The two offices are only a few hundred meters apart, and there is no evident line of demarkation between the tracts which they supervise.

As the principal business of the small native land-holder is everywhere the production of food, it is natural that the food crops are the chief subjects of activity of the office for selection and seed distribution of rice, etc. The Buitenzorg establishment of this office is therefore an experiment station with a restricted field of activity. The seed distribution is accomplished more by the four distribution gardens

in other parts of Java than it is by the central establishment. I spent the most of several days at this central establishment, which is in the district or locality known as Tjikeumeuh in the lower part of Buitenzorg, some two or three miles from the Botanic Garden. The chief subjects of study here are rice, maize, and maniok. Rice has of course received the foremost attention. Experiments have been made within the last few years on something more than a thousand native varieties of rice. These have aimed to answer almost every question of economic importance: the identification of varieties and establishment of the characteristics of each as a basis of recommending the most productive or otherwise most desirable varieties for different localities, different seasons, and different specific uses. The general types of rice in Java and the Philippines are identical. Thus, we see in Java bearded and beardless rice, glutinous and non-glutinous varieties, grain of the same range of form and color which are familiar in the Philippines, and varieties said to range over the same length of growing season. The selection work at Tjikeumeuh follows strictly what has come to be known as the Svalof system, because first put into well-known practice at the Swedish Experiment Station of that name. All selection is along pure lines, the individual plants being the basis. It has been evident from the start in Java, as here, that the named local varieties are themselves mixtures so diversified that they are not in their natural condition fit subjects for selection. Accordingly, single plants have been selected from the local plots of the various promising varieties, and these plants are the parents of the strains which have been developed and distributed. This system is exactly the same inaugurated here in the thesis work of Mr. Marcelo Crisostomo. Work of this kind is necessarily slow because beginning with a single plant; the strain must be built up until plots can be tested before conclusions are justified or seed can be distributed.

Upland rice is of far less relative importance in Java than in the Philippines, the area being very much less than that devoted to paddies. In some parts of Java, including those which I visited, rice can be raised at all seasons, and a very large part of the country is at all times in rice. In this region, rice in every stage can be seen at one time and from one place. The seed beds will be found in one paddy, while in neighboring paddies the ground is being worked, or the plants have just been set out or will be half grown, and in others in the neighborhood, the harvest is already taking place.

In Java, as in Japan, the production of rice is less than the demand. This has been true, I believe, during every year for something more than a decade, and has resulted inevitably from the rapid increase in population of the island. But from Java as from Japan, there is still a very heavy exportation of rice. This exportation is of superior rice which brings the world's best price. While this exportation takes place, there is a more extensive importation of materially cheaper rice from Indo-China and Burma. The higher price received for the rice exported goes a good way toward paying for the larger quantity required for local consumption. This economic advantage, resulting from the production of a very superior quality, is a fruit of the activity of the Government in constantly distributing seed of rice of the best strains, and so raising the general level of the quality of all Javanese rice.

Maize is the second in importance of Javanese grain crops, or it might be hardly incorrect to say that it is the other grain crop. In Western Java, the part of the island with the heavy and comparatively constant rainfall, it is raised only during the drier season, and even then, the scientists ascribe to the wetness of the climate the fact that the product is smaller than would be regarded as decent in the Philippines, and therefore incomparably smaller than would be regarded as fair in typical corn-producing countries. The Government seems so firmly convinced of the impracticability of producing large ears that it practically does not make the attempt, and aims at securing the largest possible yield by producing the greatest possible number of the ordinary nubbins. The local taste in Java, as in the Philippines, is for a decidedly hard corn, and there, as here, whom the corn is used green, it is harvested and eaten in a condition considerably more advanced than the green corn of the United States. In rice, on the other hand, the Javanese taste is for a grain materially less hard than in the Philippines, and the method of cooking is correspondingly altogether different. Mr. Koch, who was my guide and informant at the office for work on rice and associated crops, was inclined to believe that the ears of corn which I took from this college were not essentially different in kind from strains already in culture at Tjikeumeuh, but that the larger size of ears was due to climatic conditions.

All maize in Java is more closely planted than we believe here to be good practice. One of the varieties, known as Madura corn, ripens its crop completely in about sixty-five days, and the plants only reach a height of about a meter. This corn is planted in rows about

half a meter apart, and not more than a third of a meter apart in the row. In selection, preference is given to plants which produce two ears on each stalk, the belief being that, even though these ears may be somewhat smaller, the ears, when only one is produced, are still so small that the production of two ears increases the total yield.

While I did not visit the parts of Java where maize is of most importance, and was at Buitenzorg during the season when no maize is raised, I am fully convinced, from the varieties grown, from the seed stock kept at the Tjikeumeuh station, and from the information given me, that the natural conditions for maize cultivation in Java are in general very poor,—decidedly poorer in fact than in the Philippines. This being so, I was surprised indeed to learn that about 10% of the annual maize crop of Java is exported, and that this export is in part to Holland and in part to Australia, about the last place on earth to which I would have expected it to be possible to export this crop from Java.

Root crops are given great attention at Tjikeumeuh, and among these, maniok very properly receives the foremost attention. The Dutch Indian Government has directly imported a considerable number of varieties of this plant from Brazil, beside collecting what were available in the Orient. Beside cultivating these various pure strains, working according to their usual plan with the individual plant as the basis of selection, they have also raised a large number of seedling strains, and so increased the number of strains and the range of variation. On the whole, the best results up to the present time have been obtained with some of the strains imported from Brazil.

There are a few spots in Java where, for local reasons, maniok is the principal food staple. This may be because the climate is very dry or because, in spite of their having reasonable rainfall, the soil is so porous that irrigation is not practicable. Any condition which makes rice growing impracticable brings the maniok to the front. The work on trial plots at Tjikeumeuh has shown yields about the same as some of the best which we have obtained at Los Baños. It is evident from these results that the same ability which will produce 80 to 100 piculs of food in the form of rice on one hectare of land will produce fully 250 piculs of food in cassava on the same area, and that the production of the cassava is with materially less expenditure of labor.

It follows clearly that cassava can support a much denser population than rice, not only because it produces more food to the unit of area, but because at the same time it leaves more labor free for other employment. Against this, there is in Java, as in the Philippines, a distaste for cassava as a staple food, and a popular feeling that in large quantities it is not healthy and strength-producing. As to its palatability, the trouble is unquestionably with the method of preparation. There is no disposition anywhere to regard tapioca with disfavor, but the cassava is usually eaten in the tubers instead of after the preparation which would make it really acceptable. As to its food value, it is more digestable than rice, but not as complete a ration. It therefore needs to be combined with other foods, and its excess in production over rice is so great that the production of the necessary other food as a side issue should be a very simple matter. It is gaining rapidly in respect throughout Java as a famine food which it is well to have always available in case of emergency. The Government of the Indies is pushing this use of it by encouraging the planting in every community of at least a small area.

Aside from its local use as a food, cassava is of considerable and increasing industrial importance as an article of export. Even in country as wet as that I visited, I saw very numerous small fields of cassava between Batavia and Buitenzorg, which, altogether, would amount to a very considerable area in this crop. Seing these small fields, I imagined at first that they were for local food, and was much surprised at the area devoted to it. It was afterward explained, however, that while some of this crop was sure to be used as food, and an appreciable part of it might be so used if other crops failed, it was expected that the larger part of it would be sold to factories for the manufacture of cassava flour or starch. In the drier part of Java, the production of cassava flour is becoming a very important industry. I got statistics for instance, with regard to one plantation, run by a company with a capital of Fl. 2,000,000, which paid dividends on its crop of 1913 amounting to Fl. 1,350,000. The cost of production per picul is about Fl. 3, and the normal price is about Fl. 6 per picul. At the outbreak of the European War, the price fell for a few days to Fl. 1.35. As in the case of the slump in copra in the Philippines at the same time the effect was that there was no market at all. As in the case of copra, the slump was temporary, and the price has for sometime been normal. This company uses 3000 bouws (the bouw is seven-tenths of one hectare) of land. The crop

is regarded as a very sure one, and the price of Fl. 6 as a normal one. Apparently, one may conclude that the business is handled on a very wide margin of profit. It may be noted in passing that the 3000 bouws of land does not belong to the corporation, but is in the hands of the Javanese natives, who rent it on very short leases to the company. The practice is therefore not to use the same fields for this crop for a succession of years. This is also true of practically all sugar land in the Dutch Indies.

While speaking of maniok, I may note that in the Institute for Plant Pathology, the insect pests of this crop have been studied with more care perhaps than those of any other single staple crop. One of these pests which is most destructive is the "red spider." This is also found in the Philippines. It has not proven a serious pest here, but might be expected to do so if the crop were raised in any locality on a very large scale. Practically every recognized insecticide has been tested against it, and without practical success. The method recommended by the entomologist who has done this work is to strip off all infected leaves and burn them. If a reasonably careful watch is kept, this can be done when the pest makes its appearance, and the resulting damage will not be very great. If the pest gets a good grip on the plantation, the amount of foliage which must be removed will of course reduce the thriftiness of the plants, so that the crop will only be a third or a half of the normal one. Another pest is a beetle which deposits its eggs in the ground at various depths, reaching down even to as much as 90 cm. This is of course far beyond the possibility of exposure by plowing. It is possible to disinfect the soil by the use of carbon bisulphide, but only by doses which are impracticably expensive. The most effective way of combatting this sest where the population is as dense as it is in Java, is for boys to watch for the beetles after dusk when they appear from the soil, and to kill them as they emerge. If let alone, this pest will attack the tuberous roots, and destroy a large part of the crop.

The root crop which stands next in the attention it has received at Tjikeumeuh is the sweet potato. It is interesting to note that the name "ubi," which, in the Philippines, is restricted to certain varieties of Dioscorea, and which, in vulgar Malay seems to apply to any root crop, is more specifically used in Java for the sweet potato. The selection work on sweet potato at Tjikeumeuh has been carried on with all available varieties, local and imported, and also by the production of seed; and in this case, some of the seedlings, from varieties which were themselves regarded as superior, produce yields of something like twice as much as the parent strains. When these results are obtained with seedlings, the individual plants are propagated in the usual vegetative manner until a stage is reached where distribution becomes possible. With the sweet potato, this stage is reached fairly promptly, so that a successful experiment of this kind is not long in resulting in materially larger yields by the native Javanese, without the slightest additional expenditure of money or effort. Including the seedlings, the experiments at Tjikeumeuh have included plot work with something more than 600 separate strains.

Work has also been done at Tjikeumeuh with the native Dioscoreas, but these seem on the whole to be inferior, at least in production, to some of the Philippine varieties. In Java, as here, the varieties which produce comparatively small tubers are on the whole more likely to be regarded as desirable food. The very slender, deep-rooting varieties, comprehended under the term of "Paquit" in the Philippines, seem unknown in Java. No Javanese varieties are known to produce yields comparable to those obtained at our college by a number of different varieties in Raymundo's cultures.

The most important Javanese legume by a wide margin is the peanut. The use of legumes for the enrichment of the soil is practiced in Java on an exceedingly wide scale. In fact, outside of the regions where rice can be cultivated throughout the year, the use of legumes and the appreciation of their soil-enriching value can be said to have become almost universal. It has already been noted that they are used throughout the Government forestry plantations. They are also used universally on sugar lands in alternation with the sugar, and on the tea and coffee plantations planted with the regular crop, but kept close to the soil and continually cut down and worked in. The peanut is not merely valuable for this reason, but is apparently the foremost leguminous food of the Javanese, and is in very extensive use for the production of oil. Mohammedan culture, with its prejudice against animal products, places a higher demand than that of other parts of the world on vegetable oils, and the peanut is the chief oil-producing plant of the Javanese. Coconut oil is of course extensively used, but the higher rank of peanut oil is attested, for instance, by the fact that the apparatus used in native coconut oil manufacture is always that which is primarily designed for making peanut oil. Both insects and fungi do considerable damage to peanuts in Java. The most

troublesome fungus is one which is also common in Los Baños, and probably throughout the Philippines. The most destructive enemy of peanuts in Java, however, is bacterial in its nature. This produces bare spots in the field, and even on the experimental plots at Tjikeumeuh it has not proven possible to control it entirely.

Second in importance of Javanese legumes is the mongo. As in parts of Pangasinan, so in places in Java, this is regularly raised in alternation with rice. It is eaten in Java, as here, usually in the form of the very young seedling. In Java it is regarded as a cure for beri-beri, and is said to be consumed not so much because it is liked, as for its value as a preventative of this disease.

Regarding the relation between rice and beri-beri, the disposition of the Javanese and the Filipino is the same,—that is, to use polished rice and to regard unpolished rice as not merely inferior but as somewhat degrading. The Government in the Dutch Indies issues unpolished rice in its prisons and to its troops, but has not made such a propaganda as has the Philippines Government to secure the extension of the use of the unpolished grain. The reason for this is perhaps that it has not as practicable a method, as is furnished here by the public school, for carrying on this kind of a campaign.

Voandzeia, which for some time has been boomed as a likely substitute for the peanut, has been tested at Tjikeumeuh as in Los Baños, with the same conclusion, that there is no present reason to suppose that it is the equal in any respect of the peanut itself. Some work has been done with soy beans at Tjikeumeuh, but on the whole it has not been successful, and the conclusion has been that the climate, at least in the wet part of Java, is such that this crop cannot be expected to succeed. At Los Baños, we seem to have found during the past year some strains of the soy bean which are suited to rainy season conditions. Psophocarpus, which we regard at Los Baños as a most promising legume for two or three purposes, is unknown at Tjikeumeuh. The "batao" of the Philippines is known in Java, but regarded as of no importance, and practically the same thing is true of the cowpea.

We come now to the Institute for Phytopathology and Plant Breeding. Of all the scientific and practical establishments under the Javanese Department of Agriculture, this has the most which should have been serving us for a number of years as a model for work in the Philippines. It is the feeling of the staff that the personnel of this office is not adequate to its work. The fact is, however, that it is a far larger technical staff than has ever been available for similar work in the Philippines, and as far as I met the members of this staff, they are qualified for their work with a uniformity which is rare in any establishment.

The feeling seemed to be prevalent throughout the whole department that the fungus diseases of plants are the particular field which has been least adequately attended to by the Javanese Government. This surprised me somewhat as there are five men in the Department of Agriculture whose work in this field was previously well known to me, and the result of whose work has been repeatedly taught to classes in our college. The head of this office is himself a well known specialist on fungus diseases, and there are two other splendidly trained men in the laboratory. Three other men who have done work in the same line are in other offices of the department, and at present otherwise engaged. More or less attention, all of it careful, has been given to fungus pests of almost every Javanese crop, and work of this kind is now being done in the laboratory of the Institute at a rate which, if it would not suffice to promptly solve our countless problems, would, at any rate, constitute a practical revolution if we were duplicating it in the Philippines. Beside all of the work of the Government, work on the diseases of tobacco and sugar is being done on a large scale in the laboratories maintained by the planters' associations.

The work on fungus diseases is only in part the function of the mycologists. Beside what all of these men have done, the fungus diseases of coffee have been taken up by plant breeders, and the work which these men have accomplished in Java has been a model for the world. If with all that it has accomplished, the feeling of the Buitenzorg Department is that fungus diseases have received inadequate attention, what must they think of the record we have made? Professor Baker and myself have been harping on this subject until those who receive our communications ought to regard the subject as a sore spot, and to feel the pain whenever it is brought up. If there is any possible way in which the Philippine Government can be made to appreciate the losses which agriculture in these islands is incurring from the Government's failure to act effectively, I wish that this way might be discovered.

As I expected, I found in Java a number of fungus diseases already familiar to me here, but as I also expected, I found men busy in

Buitenzorg experimenting with means of restricting the damage and in putting the most practicable means into extensive use. Of this year's graduating class in our College of Agriculture, two have prepared theses on fungus diseases, and both of them have occupied themselves chiefly with the practical restriction of damage by these pests. In one case, Javan work which was available to us had gone so far that we have had no preliminary work to do, but have been able to go to the farmers with a demonstration which had already been made by both British and Dutch scientists.

Across the street from the fungus laboratory is the laboratory for economic entomology. Two excellent entomologists are occupied here, but are acutely conscious of the impossibility of covering their field without a larger force. They are not merely investigating a considerable number of important insect pests, and doing surprisingly thorough work in this direction, but at the same time are carrying on a campaign of popularization in the attempt to extend the fight against these pests to all parts of Java. I am accustomed to hard work and efficient service by the scientific staff with which I am associated, but even so, it was a great surprise to me to see how much is accomplished by the two entomologists in this institute.

The remedy for their situation—that is, one in which the most competent staff is confronted by problems far in excess of its powers,—is approaching its solution in the Philippines; we meet exactly this difficulty at the College of Agriculture by training students as assistants, and by using them even before graduation in such preliminary general and statistical work as reasonably competent young men can do before graduation. With the increase in the number of our graduates, and the selection each year of those men suited to such work as graduate assistants, with the prospect that ultimately a faculty of adequate size can be built up by this means, we can hope with confidence that not a great many years will be required before it shall be possible for this college to tackle any problem of scientific agriculture with the necessary trained staff and the necessary number of hands. I suggested this method of meeting their difficulty to the men in the Tjikeumeuh Institute, and at first thought it did not strike them as practicable. As a matter of fact, a solution in the same way must be much farther off in Java than it is here. Nevertheless, when I explained to them the methods we are following, and told them at some length of the results we are already obtaining, how for some problems we have found it possible to collect information by the use of fifty pairs of hands and eyes under a single direction, and how for other work we have already found it possible to train students to the point where they can supply a great deal more than hands and eyes, and are making it possible for us to do such work as that of the past year on coffee rust and the diseases of the cacao fruit, with a staff very much less adequate to doing the work itself than the Javanese Government has been able to provide, the men in Buitenzorg were ready to agree that the general plan is the best one which can be followed in Java, as in the Philippines,—or anywhere else.

Beside the work of the two laboratories, the Institute has extensive gardens which are in the most intensive use for plant breeding. In this work, as I have already noted, they pay particular attention to crops of interest to large plantations, but at the same time they are experimenting with the acclimatization of a very large number of introduced plants of possible or probable future value. The foremost attention has been given to coffee and rubber. The coffee rust attacked Java several years before it reached the Philippines, and absolutely nothing but the difference in the two Governments is responsible for the fact that Java has still an exceedingly important and profitable coffee industry, while that of the Philippines has been dead for the past twenty-five years. The Javanese Government met the coffee rust promptly with a fight by means of fungicides, by selection of the most resistant plants to be found locally, and by the importation of every other kind of coffee which could be found in the world. The result is that the various species of coffee which are now being experimented with at Los Baños, and in almost every other similar institution in the tropics, have all been brought to our attention by the Government of the Dutch Indies. The first of these to show great promise was Liberian coffee. This was widely heralded as a rust-resisting species, and was extensively planted in Java, and to a lesser extent in many other parts of the Old World tropics. It developed after a time that the quality of the marketed Liberian coffee was such that it could only be raised with a profit where labor is exceedingly cheap, and that even here it was at a serious economic disadvantage. The Dutch Government met this difficulty by a careful study of methods of preparation, with the ultimate result rather recently obtained, and for which, although I have myself made a considerable study of the subject, I was absolutely unprepared,

hat the Liberian coffee produced in Java is now being marketed at a price above that of the Arabian coffee for which Java itself is so famous.

A wholly new and unexpected difficulty then presented itself. The Liberian coffee began to be attacked by rust, and these attacks increased in virulence year by year, until the coffee rust of Java now attacks Liberian coffee with approximately the same violence as Arabian. This is at the same time a matter of prodigious practical importance and a fact of the utmost scientific interest. Neither the coffee nor the coffee rust is native in Java. It is practically impossible that the rust which now attacks the Liberian coffee should be anything else than a descendant of the rust which was formerly able to attack Arabian coffee but not Liberian. In other words, the pest has in the course of a number of years developed wholly new properties. Uninfected Liberian coffee has been exported from Java and raised elsewhere, and found immune to the rust of the other regions. At the same time, new importations of Liberian coffee, immune to rust in the places of origin, have been brought into Java and promptly attacked. Now, the ability to live on a particular host is in very many cases regarded as a good specific character of a fungus. It can accordingly be regarded as definitely established that there has been developed in Java during the last twenty-five years a fungus of known parentage, but which now has characters specifically different from those of the parent coffee rust of Ceylon. This is the most satisfactory case known to me in the whole realm of science, of the evolution of a new species from a known parent within a definitely known length of time, and under conditions which are a matter of satisfactory record.

The Dutch Government is working with a very considerable number of other species of coffee, several of which are at present immune to rust; but as the result of its experience with Liberian coffee, confidence is not felt that any one of the other species may not be attacked by the rust at any time in the future. The most extensively planted coffee in Java at present is Robusta, but this is of decidedly low grade. Of the various species under experiment, Abeocuta is regarded as the most promising. In most respects, this is very closely related to Liberian coffee, and produces a market article of essentially the same quality. At present, it is almost immune to rust attack. In our upland clearing on Mount Maquiling, we are working with this and with various other coffees, the most of them received from the Buitenzorg authorities. The product of 1912, and the present market price of the three principal Javan coffees, are as follows:

	Yield in piculs. 1914	Price per ½ kilo in Dutch cents.
Robusta...	554,863	30 to 34
Arabica....	193,492	46
Liberica....	36,071	50

Some work has been done in Java with all the trees regarded as likely to be commercial sources of rubber. The oldest plantation rubber of Java is the original India rubber, Ficus elastica, but the only rubber which in recent years has been extensively planted in Java is Para rubber, Hevea brasiliensis. While Java made a later start in the cultivation of this tree than did the Malay States and Ceylon, the recent development has been rapid and the work now being done by the Government is, in selection at least, the best and most comprehensive regarding which results anywhere have been made known. The plantation Hevea of the British colonies is all descended from one collection of plants taken originally from Para to Kew, and thence to the Straits Settlements. The descendants of these plants have been distributed to planters by Government institutions in the Straits Settlements, Ceylon and the Malay States, and seed which is bought from planters or obtained from the Government in these countries is practically certain to be descended from the original Kew plants. Some years later, a Paris house made a new importation of plants from Para. By luck or judgment, the original Kew stock seems to have been of a decidedly productive strain. The most of the plantations in Java obtained their seed material from the British colonies. One large plantation was established with the Paris strain, and the yield has turned out to be only about half that of the plantations using the Kew strain. The same result has been observed where neighboring plantations have used the same strains in Africa. It struck the experts of the Dutch Government at once, that if there were strains poorer than the one in general cultivation, there might also be expected to be strains more productive. It is also known that the rubber from different parts of the Amazon Valley is quite different in value. That collected near the mouth of the river brings a higher price than that collected at some distance in the interior. The strain from the extreme back country brings the highest price of all, but this is supposed to be because of the long time between its collection and its marketing, and the consequent loss of water. It is also understood that in the Amazon Valley there is a great difference between

the yield from individual trees. However, definite and reliable information as to this point has not been published. There are many species of Hevea in the Amazon Valley, some of which are practically worthless. How far the supposed difference between trees is due to difference in individual plants of Hevea brasiliensis, and how far it is due to confusion of species, is still an open question.

As the plantation rubber of the Orient is all descended from a few original plants, the opportunity for improvement by selection on the plantations is a limited one. To get material for a wider range of selection experiments and at the same time to introduce wholly fresh strains which might be of greater value, and would certainly furnish superior material for cross-pollination and eventual hybridization, Dr Cramer, previously well known as an expert in plant breeding, and as a student of the rubber tree, went to the Amazon Valley where he obtained a large collection of seed, each sample carefully selected from a single parent tree. He obtained seed from many trees of Hevea brasiliensis at different localities, and also from a considerable number of other species of Hevea.

The seedling plants are still too young to furnish any information as to the yield of rubber but a difference in the strength and thriftiness of the different strains is conspicuous, and this itself is sufficient to make it somewhat likely that some strains will prove valuable and practically certain that others are valueless. Hevea is never grafted and will not grow from cuttings. The plants can be marcotted while young, but not after they become old. In order to get practical results with as little delay as possible from the strains which finally prove to be productive of rubber, the plants in the plots where growth is most vigorous are marcotted, and in this way a large number of young trees is obtained.

While I do not consider that Para rubber is a crop of much industrial promise in the Philippines, the methods by which the Javan Government is undertaking to improve this crop in Java should serve as a model for similar work with the numerous tree crops which are of importance in the Philippines. The Buitenzorg work on Para rubber is well calculated in due time to give the Java rubber industry the same preeminence which Java coffee, and in a still more conspicuous measure, Java Cinchona have obtained in the past. If we want to be able to expect that any of the lines of Philippine industry will ever obtain the same kind of eminence in competition with other countries, the same methods must be adopted here. These methods do not bring results in a day or a year, but in a term of years they are perfectly certain. There is at present no agricultural product in which we compete with such countries as Java and Ceylon, in which the product of the Dutch Indies and Ceylon is not regarded as of superior quality. Because of the better general education of the Filipino as compared with the Javanese and Singalese native, this comparison can be reversed with almost every competitive crop. The education of the Filipino, taken alone, will not produce this result, and will hardly tend to produce it. It can be done only by the same methods which the Government of the Dutch Indies is already employing on a wide scale and with a high measure of perfection. This work can only be undertaken by men who know their business thoroughly, and it cannot be done by men who are too busy with any other work to give careful attention to this particular effort.

Tea was introduced into Java in the third decade of the last century. The first introduction was by a German at the instigation of the Javanese Government. For about fifty years, this being during the time that the "culture system" was the characteristic policy of the Government of the Dutch Indies, tea was a Government monopoly, and was raised on Government plantations. In 1876, I believe, the Government tea plantations were no longer profitable and the culture system as a whole was coming into disrepute, and the tea plantations were sold to large private interests. At about the same time, the coffee rust began to effect the ruin of the coffee industry of Western Java, and the big plantations, in search of a substitute crop, adopted tea on a large scale, just as had already been done on a still larger scale in Ceylon. The expansion of the area devoted to tea has been going on ever since, and is quite rapid at the present time. No export crop can expand in Java in effective competition with the Javan food crops, but tea is raised at altitudes above those which are in demand for any food crops, and has spread extensively at the sacrifice of the forest. For a considerable time, tea was exclusively a plantation crop in distinction to a product of the small native land holder; and the fact that, like sugar but in less measure, a factory investment is necessary for the handling of the crop has tended to keep it in the hands of the larger plantations.

However, tea is a product which demands much labor both for cultivation and harvesting, and which yields a valuable product from a small area. It is therefore well adapted in

these respects to native culture. The natives in the vicinity of the plantations therefore took up the planting of tea for themselves, and sold their fresh produce to the plantation factories for curing. This native industry developed until the kampong tea, as the small-scale product is called, amounted to about 10% of the total export. Since tea requires very perfect care in order to produce a product of good quality, and the natives were not trained for this industry, but were able to make a profit satisfactory to themselves without the exercise of proper care, the effect on the industry as a whole was thoroughly bad. Still the individual plantation factory was able to buy the native tea, cure it and sell it at a profit, and the industry grew in spite of the fact that the reputation and consequently the price of Javanese tea as a whole were seriously prejudiced.

On a good tea plantation, the ground is made perfectly clean and is kept perfectly free of weeds at all times. A weed is at least as rare on a Javan plantation which may have several thousand hectares, as it is on a well kept market garden in Manila with an area of one-tenth of a hectare. In this respect the treatment which the Javanese native gives his plants is satisfactory. A weed is everywhere a rarity in Javanese cultivation. But beyond this, the tea plant cannot be shaded without injury to the product, and the Javanese native is addicted to mixed plantings. If given his own way, he invariably interplants his tea with bananas, and frequently uses plants of still longer life, with the result that his tea is not what it should be. Finally, except that the tea is rested for a short period during each year,and permitted to gain a fresh growth and build up its strength, the young tips should be collected regularly and often. The plantation practice is to go over every part of the field once in ten days, and never to harvest a tip with more than three young leaves. The native, if left to himself, is satisfied with collecting the crop once in three weeks, and harvests about five leaves on each twig. In addition to these troubles, the supply of kampong tea to the factories was irregular, with the result that the factories would occasionally receive much more than they could properly handle.

The situation was summed up in a circular issued by the "tea expert bureau" at Batavia in 1912, as follows: "With regard to the kampong class of tea, this has largely been disappointing and below the standard, produced at the beginning of the year. The reason of this in many cases appears to have been the purchase of larger quantities of wet leaf from the Natives, than factories have been able to cope with under normal conditions, resulting in the manufacture of an undesirable class of sour and burnt common tea, which in some instances could scarcely be described as fit for human consumption and when offered for sale could only tend to bring Java tea into disrepute." At this time the average price of Javanese tea on the world's market was about 12% less than that of the tea of British India and Ceylon, in spite of the facts that the Javanese plantations themselves were working under natural conditions as favorable as obtained anywhere else, and were giving their tea as careful and as competent attention as tea received anywhere in the world. An appeal was made to the Government to relieve the situation, and it sized the problem up as follows:

First: The good name of the export article must be taken care of; but

Second: An economically weak element of the population must not be sacrificed for an economically stronger element (that is, the native must not be sacrificed for the foreign planter);

Third: The freedom of business must not be interfered with.

The essence of this summary of the condition is that it excludes a proposal which had been made to the Government, to classify and tax tea so as to hinder the exportation of the kampong product, and so to practically destroy the tea business of the native.

It is a widespread idea that business is itself an educator, that the producers of an article will, for their own sakes, improve its quality if poor quality is penalized by its price. This sounds reasonable, but it is certain that the poor quality of their product and the consequent poor price of all Javanese tea had very little if any effect on the kampong tea of Java; and it is my experience in the Philippines that business is just as poor an educator of the native farmer here as it is there. In fact, it would hardly be too much to say that the low price due to the poor quality of Philippine copra and much Philippine abaca tends to result in the production of more low-grade product, rather than to raise the quality.

What the Dutch Government did and is doing is to apply itself directly to the improvement of the kampong tea industry by going directly to the native tea producer. There was a time, but it is long ago past, when the Javan Government interfered with the personal industry of the Javanese natives. The Javanese is

practically as free as the Filipino to do exactly what he chooses to do. Also, being considerably less educated, he is considerably less susceptible than the Filipino to mere argument. But the Dutch Government is very far from helpless. If the Government does not own the Javanese native, it does own the most of the Javanese land. The Javanese, like the Filipino, appreciates the fundamental value of land, and wants it. The Government had already a corps of agricultural inspectors or lecturers, and in the tea district it applied this staff particularly to the improvement of the tea industry. An appeal was made, and was brought home to the individual native by means of the lecturers and their native overseers and assistants. One bouw of land was offered to each native, on condition that he handle this land under the supervision of the lecturer.

In company with the head of this service and the agricultural lecturer for the Soekaboemi district, I visited the region where this work is going on. Leaving the railway station, we passed great tea plantations in beautiful garden condition, and old tea kampongs (villages) where the difference between the native and the plantation treatment was very conspicuous. We then came into a country where there were large areas in young tea, in adjoining plots without a break between them, one bouw in each plot, on which the treatment of the tea was in no respect different from that on the best plantation. We also visited a tract where a large area is being cleared and just brought into cultivation in the same manner. All this country was once in coffee, and has had no permanent cultivation since the old coffee industry was locally ruined. The recipient of land clears it clean and is permitted to plant one food crop. This is usually upland rice, but may be sweet potatoes or anythihg else which the native chooses. While this crop is maturing, tea is germinating in a nursery. The seed is furnished at cost by the Government from a plantation kept for this purpose. When the food crop comes off, tea is immediately planted in its place, and no crop may ever be planted which will shade this tea. The preparation of the land, the planting of the tea, its subsequent care, and its cultivation are all under the strict supervision of the district agricultural lecturer and his overseers.

This work is absolutely in the interest of the native. He gets a larger yield than he could do by his own methods, and makes more money by the same expenditure of effort. The old native tea growers learn from the neighboring tea growers under supervision what they would never learn from the practice of the European planter. The quality of Javanese tea as a whole is accordingly improved, and all Javanese tea brings a higher price. These results are accomplished without the slightest formal interference with the liberty of the Javanese native. The benefits of extremely paternalistic Government are obtained without any of the disadvantages.

The most of the land in the Philippines also is owned by the Government.

In closing with the subject of tea, and to give an idea of its importance to the native producer, it may be said that the receipts of native growers in the Soekaboemi district alone amount to Fl. 800,000 a year. It is also said that the plantation factories handle this tea at a profit of approximately 100%, the investment being tied up for from one to two years. The tea of Java was originally the Chinese species, but this is giving way rapidly to Assam tea, which is exclusively planted at the present time. There are certain districts in the Philippines which I believe will be more productive in tea than in any other crop; and the head of the tea laboratory in Buitenzorg has promised to send me seed of Assam tea with which we can make a test.

We come now to the subject of education. As already stated, I have no knowledge obtained officially as to the work of the Department of Education. I believe, though, that there were in 1913 native schools in the whole of the Dutch Indies as follows: First class, 88; second class, 1187; and village schools, 3473. The village schools give a course of three years. Instruction is entirely in the local language, and all of the work is very elementary. In the second class schools, also, the language of instruction is the local one, but I believe that the Dutch language is a subject of study a part of the time. In the first class schools, the course is five years, and an attempt is made to give enough training in Dutch to qualify the students for the use of this language. Each of these schools gives a finished course, so that a student who has the four years of the second class school is not qualified to enter the fifth year of the first class school. There are also in Java what are known as MULO schools. These schools give a course of three years, all work being handled in the Dutch Language. Their work corresponds quite exactly to that of the high schools of the Philippines. It will be observed at once that there is a gap of two years between the first class native school and the MULO school. There are other secondary schools in Java, which prepare students for the Dutch universities; and there is the small system of

elementary "European" schools. This system is planned for Dutch student and does not integrate with the system of "Native" schools. The word "Dutch" in this connection includes everybody who has any Dutch blood. In all public schools, there is no restriction as to nationality any more than there is in the Philippines. The situation is that the Javanese native is at liberty to enter the MULO school, but has practically no way of preparing himself to enter it. As might be expected, the attendance in the MULO schools is very largely Dutch.

Except for the Medical School in Batavia, which is understood to maintain very high standards, all technical education in Java is under the Department of Agriculture, Industry and Commerce. In considerable part, the educational work of this department is general rather than in schools. The agricultural lecturer, who has the functions in tea country which I have already described, and deals with the various local crops in the different districts of Java, is also expected to lecture extensively, and these lectures are said to have very appreciable influence on the industry of the people. In agriculture, the department has three kinds of schools: the Rural Schools, which are at present fifteen in number in Java; the one Culture School (this school deals with culture of crops, not with culture in the academic sense); and the one College of Agriculture in Buitenzorg.

I visited one of the Rural Schools in the neighborhood of Soekaboemi, and of all that I saw in Java, the work of this school was the most surprising single thing. The course is of two years, and students are able to enter and do its work after they finish the work of the second class native school. Some of them are graduates of the first class schools, and some have been admitted from the village schools, but the village school graduates have proven insufficiently trained. All work in this school is in the native language. In the school I visited, there were two teachers, the principal one being a graduate of the Agricultural College. The school house is a sawali building with two rooms, beside two others which are used to store produce and tools. The roof is of tile on a framework of bamboo. There are three and a half hectares of ground, and these are cultivated with characteristic Dutch and Javanese care. Among the crops I saw European vegetables, such as beets, beside the various native vegetables and farm crops, Rice receives the foremost attention, as might be expected. The school has its own carabao, and some particularly fine goats. It has also its pond of gold fish. The students are busy in the class room or field throughout the day. Of the thirty students, twenty-six live in or near Soekaboemi, the others coming from considerable distances, even up to more than a hundred miles. Foremost attention is given to the practical work in the field. In this the students are drilled under the careful supervision which might be expected where there are two teachers for twenty-six students. A business record is kept of every operation on the farm, and everything which is produced is used or sold. There are a few coconuts on the land, and the nuts are sold as they ripen. A careful record is kept of this as of everything else, and the moneys received go to the support of the school.

The surprising thing about the school was the equipment for class room work and the work which the students do. This equipment includes a very full set of such implements and tools as might be used in native agriculture, and laboratory equipment beyond the needs of the students for their own work but serviceable for demonstration. Among other items of equipment was an excellent anatomical model of the ox. Every student is trained to dissect and assemble this model, and learns the use of each of the organs. The wall charts are such as I have seen in well equipped colleges, but never saw before in a rural school. So far as I could judge, the work of the students measures fairly well up to their equipment. When we reached the school, a class was being held in a subject which, in the Philippines, would be somewhere between nature study and botany. The students were able to go to the board and illustrate, while they recited, the development and the simpler structure of the plants which they were studying. The note-books included lengthy descriptions or reports which I could not read, but were very freely illustrated with excellent drawings. I have imagined that there were very real difficulties in the way of the use of native dialects in technical school work, but the work of this school was better in the class room, and more practical in the field, and more thorough throughout, than I have ever seen anywhere else in a training school of similar kind.

The Culture School at Soekaboemi has been in its present place for only ten months,—that is, since the beginning of the current school year. It had previously existed for several years in Buitenzorg. For its reception in Soekaboemi, an area of perhaps ten hectares (I do not know the exact area) was purchased at a price of Fl. 800 per bouw, that is, somewhat more than ₱900.00 a hectare. Buildings were

erected at a cost of Fl. 120,000, and equipment was provided at a cost of approximately Fl. 30,000. The grounds were laid off with due regard to use and architectural effect, the necessary roads and paths were built, and the school began its existence with every initial advantage which could be provided. The school gives a course in forestry and a course in agriculture. In forestry, the students are all, or practically all, pensionados, and are bound to enter the Government's service at the completion of the course, just as are the forestry pensionados in Los Baños. The member of students in forestry is 23 in the first year, 24 in the second year, and 15 in the third year. In agriculture, there are a few pensionados, but the majority of the students are private. The numbers are 27 in the first year, 20 in the second year, and 11 in the third year. The students are admitted to this school from the first class native schools. Experience has already shown that the preparation given in these schools is insufficient, particularly in that it fails to give them sufficient knowledge of the Dutch language to qualify them to receive lectures with profit. Accordingly, a preliminary year will be given during the coming year, attention being given entirely to Dutch.

Of the present courses, the work of the first two years is for the most part preparatory and scientific, rather than technical. Accordingly, the work in agriculture and forestry during these two years is the same, except that in their field work, they are likely to be given different kinds of practice. The effect of this is in turn that the technical studies are confined to a single year. The work in forestry is further handicapped by the fact that there is no forest in the immediate neighborhood of Soekaboemi.

Because of the youth of the institution, it is of course inevitable that all work with permanent plantings is just being begun. The use of the land is, however, definitely and permanently planned, and the areas intended for coffee, tea, and various other permanent crops are already occupied with the seedlings, or young transplanted plants, which are to occupy them permanently. The nurseries are also in full operation, and the work with annual plants is being carried on almost as it probably will be ten years from now.

While the work of the rural school in the native dialect surprised me by accomplishing more than I would have believed to be possible, the work of the culture school struck me as failing to realize what ought to be its possibilities. Just as the rural school had an equipment better than I ever before saw used for the same purpose, so the culture school is better equipped in every thing except laboratory apparatus and library than is our College of Agriculture after nearly six years of operation. It is of course understood that the culture school is not a college, and does not pretend to be one. It is, therefore, for no want of scientific thoroughness that I would be disposed to criticize it. It is intended to be thoroughly practical, but on a better foundation than that of the rural schools; and it is the failure to make the best practical use of its equipment and of the time of the students that struck me as its weakness. In spite of its being intended to be a thoroughly practical school, it seems to me that the time actually devoted to the technical education of the students is disproportionately small, and decidedly inadequate.

After graduation, the forestry pensionados at Soekaboemi are taken into the Government's service at salaries, which, considering the standards and cost of living, are materially better than those of our graduate rangers. Reasons which the school cannot control may be responsible for the fact that the forestry students at Soekaboemi are much behind our entering students in training, but the school itself, or the authority which controls the school, is responsible for the fact that the students in it do not get more than half as much actual training in forestry as do the students in the ranger's course in Los Baños. The general situation in agriculture is not materially different from that in forestry. Agriculture is a bigger subject, and would take more time for its thorough treatment, but on the other hand, the students are not enlisted for the Government service, and the Government does not appraise their value after graduation.

With regard to the class room work, it struck me as altogether strange to find that the students are taught Botany, Zoölogy, Physics, and Chemistry by means of lectures, without laboratory work, and without text-books. So far as my own experience goes, the knowledge which students can obtain in these subjects in this way is not enough to make it worth while to give the lectures; and I find it hard to believe that the students in Soekaboemi, under a recognized especial handicap of imperfect knowledge of the language in which the lectures are given, are able to profit by them more than has usually been found to be possible in other places. Throughout the course, each student spends eighteen hours a week in practical work in the field. This is apparently well planned and carefully directed. As compared with a college, the Culture School is understood to be

distinguished by this phase of its work, but as compared with the rural school in the same neighborhood, it was hard for me to see that the Culture School of higher grade was at any material advantage.

With regard to the College of Agriculture, there are at present, I believe, less than fifty students, and of these, all but two are pensionados. All of them are students of agriculture, but it is intended to establish also a course in forestry during the coming year. If this is done, the necessary faculty will be supplied entirely by the forest service. The college at present has its work scattered and is without buildings which were intended or are proper for its work. A new building is already under construction, and its cost will be between 150,000 and 200,000 guilders. This is in addition to an appropriation which has already been made for its equipment, and an additional appropriation for the same purpose, which is expected before its completion. From the plans which have already been made and approved, it is clear that it will enter the new building with very much better equipment than we have in Los Baños. The faculty consists of the Director, of three Professors who give their entire time to the college, and of a considerable, and in general indefinite, number of experts in various lines, who give the students particular instruction in their specialties. In some cases, men detailed to the college receive fixed additional compensation, and in other cases, they are paid by the lecture. So far as the faculty is concerned, the college in Buitenzorg, therefore, has the advantage, for which I have been appealing steadily during a term of years, of the service of the whole technical staff of the Government.

Except as to the instruction they receive in class room and laboratory, the students, however, are not getting this advantage, and in this respect, there is a surprising and unfortunate failure to take advantage of the opportunities at hand. The students have already the use of the grounds around their new building, and their field and experimental work is done here. They do no work in either of the Tjikeumeuh institutions, and their failure to do this is a loss both to themselves and to the Government, without, so far as I could see or learn, any real reason whatever. In other words, the strong central administration of the department is able to prevent the sacrifice of the best instruction which might result from decentralization, and does result from it in the Philippines, but has not succeeded in preventing the loss of the opportunity to do practical work which would be of great service to both students and Government.

It is evident that, with very slight increase in the cost of maintaining the college, it would be possible to handle a very much larger number of students without any loss in the quality of the work. As to the desirability of making the college a much larger institution, opinion in Buitenzorg is divided. The college, as it is operated, is designed to serve the interest of the Government and no other end. The Director of Agriculture would like to see it grow to the point where there would be twenty graduates a year, and would be satisfied at this point. From these twenty, he would hope to receive ten thoroughly first class Government employees. This is a reasonable proportion of really able and efficient men to look for in the output of any such institution. The Director of the college, on the other hand, would be glad to see a great increase in the number of private students, and would hope in this way to see the influence of the college develop to a great extent outside of the Government service itself. For this private service, the Director of the Department looks to the Culture School in Soekaboemi. In the light of experience in the Philippines, it can be said with absolute certainty that the policy of the Director of the Department, if carried out in the Philippines, would not secure more than a fraction of the same results which he himself is looking for, which might be secured by the enlargement of the school and the attendance of a large number of private students. This is for the reason that, of the private students, many desire upon graduation to enter the Government employ, and that in this way, it is possible to receive either a much larger number of trained Government employees, or if the number is limited, to select from the larger number, and thus secure services of a materially higher quality. The selection of pensionados, before they begin their technical study can of course not be expected here, or in Java, or anywhere else, to result in nearly as high a quality of service as could be obtained by selection among the graduates, in the light of their demonstrated technical ability.

There is, however, an insuperable practical obstacle in the way of any great increase in the size of the college at the present time. This lies in the absence of a means of training for admission. The students in the college are both Dutch and Javanese, but because of the obstacles in the way of the general education of the Javanese, but few of them succeed in reaching the college. The school is intended, however,

for the Javanese, and not for the Dutch, and Javanese pensionados are selected to the greatest extent possible. It is recalled that the obstacle to the higher education of the Javanese people lies in the break of two years between the first class native schools, which correspond most nearly to our Intermediate Schools and the MULO Schools, which correspond to our High Schools. The Governor-General of the Dutch Indies has interested himself personally in this situation, and has ordered that the facilities of the MULO Schools shall be made actually instead of nominally available to the Javanese people. This is to be done by an extension of the course of the First Class native schools from five to seven years, and steps have already been taken to put this change into operation. The result will be to establish a complete course in the public schools for the Javanese people, extending from the primary schools through the high schools. Javanese young men, in such number as choose, can then train themselves for admission to the Agricultural College.

What effect this will have, I will not attempt to prophesy. It was generally agreed among men with whom I discussed the subject that there is, among the Javanese people, no general sentiment in favor of advanced education in agriculture, and that the opportunities for Agricultural College graduates outside the Government service are at present very limited. As plantation overseers, they would have to compete with the Dutch, and Dutchmen with reasonably adequate training for such work are willing to go into it at salaries as low as would justify the Javanese in the expense of the college education. I was of course unable to investigate the situation personally, but the statements made to me agree that Dutchmen will almost everywhere be preferred to Javanese who are equally well trained. The Javanese is of course more proficient in the use of the local tongues, and has the advantages of "knowing the local tricks." The white man has the confidence of the native laborer to an extent which the native himself of whatever class practically never enjoys. It is the policy of the Government, (and the universal disposition of the Dutch in Java,) to insist that this confidence shall be maintained. It does this in the one possible way of not tolerating the presence in Java of a Dutchman who is unworthy of confidence. The effort and the success which has attended it are alike worthy of the most unrestricted admiration. It is the undeviating insistence on the maintenance of standards of personal conduct on the part of every Dutchman, which is the chief explanation of the tremendous force of Dutch prestige among the Javanese people. Customs vary in different countries, and some things are sanctioned in Java which would be frowned upon in the Philippines, but the things which are not sanctioned in Java are not done. The things which are not regarded as proper are not tolerated.

There is no question that, as conditions are at present, the Dutch overseer is entitled to his preference over the Javanese, no matter what technical training the Javanese might be given. Neither is there any question that general conditions are the same in the Philippines. Personally, however, I am very sure that the inferiority of the Filipino in responsibility and reliability is almost entirely due to environment and training, and it is my belief that this is absolutely the whole of the explanation. If this is true, it must follow that the unreliability of the native capataz, brought up with the standards of the past, and without much personal appreciation of the necessity of integrity beyond the danger of the consequence of graft, furnishes very little reason for rating the trained Filipino of to-day below the white man with the same training. I have probably had the opportunity to know personally more Filipinos with proper training for managers and overseers of plantations than has any other person anywhere, and for my own part, if I were selecting a man for such work, at such a salary as a college graduate can command, nothing would make me entertain the proposition of choosing any white man who could be obtained for the same price. It is my opinion further that the the Javanese and Filipino are essentially identical in racial characteristics, and that the Javanese college graduate will be entitled to the same respect which I have for the graduates of our own college. I would not be safe in trusting all of these, and I have lost money by trusting white men to handle a plantation. If graduates of the Javanese College of Agriculture are entitled to respect, it will not take them very long to get it. It does not take the Filipino very long to find out whom he can trust, and I do not believe it would take the Javanese any longer. It is therefore my opinion that whatever prejudice may obtain at present against the use of Javanese in responsible positions on plantations, this prejudice will prove unreasonable, and will disappear so far as the college graduates are concerned, whenever the college reaches the point where it can turn them out and let them demonstrate their fitness. It is therefore very much to be hoped

that, as the reformed public school system makes it possible for the Javanese to enter the College of Agriculture on their own initiative, the Government will cultivate a sentiment in favor of their doing this, and will open the doors of the college to them in whatever numbers can be stimulated to apply to it. For a variety of reasons, the Dutch are able to influence Javanese agriculture to an extent far beyond the power of the Americans in the Philippines. But even so, their influence falls very far short of that which would be exercised by an equal staff of equally competent and well trained natives. The Dutch Government has indeed accomplished wonders in Java, but there are fresh wonders which can still be accomplished by training the Javanese to lead the Javanese in agricultural development. In the development of a system of this kind, the College of Agriculture in the Philippines has reached a point which the Government of the Dutch Indies will not attain in many years.

I come now to the results of my trip. On the material side, I took to Java a box of material for propagation which fortunately turned out to contain a number of things which are likely to prove of value there. In return, I brought back from the station for rice and similar crops material of a considerable number of products of years of selection in Java which will save us a repetition of the same years of work in Los Baños. I was also given by the Botanical Garden a collection of useful and ornamental plants more valuable than the college has ever before received at one time from any source. By becoming acquainted with the Buitenzorg arrangement of activities, and with the men in charge of these activities, I was able to make arrangements by which we will, in the future, receive almost invaluable material, which has, in the past, been quite beyond our reach. Ever since Professor Baker's arrival, we have been trying to develop cacao in this college. We have undertaken to secure seeds which we could regard with confidence as representing very superior strains, from every institution in the world which we thought might possibly supply them. The result has been a series of disappointments. We have known that the Javanese Government had been engaged in work of this kind, but because of ignorance of how to go about it, we have failed to secure seed of their strains. The most of the cacao work in Java is not done in Buitenzorg, but the chief of the office in charge of it has promised to send me seed as soon as they can be obtained. I have made similar arrangements for various other things. For instance, it has already been remarked that Buitenzorg has an unrivalled collection of bamboos, and that bamboo has uses in Javan industry which it ought to have, but does not, in the Philippines. If bamboo is taken from the clumps and exported, a large part of it will fail to survive. The Director of the Botanic Gardens is having material taken from the clumps and established in Buitenzorg, after which it will be sent to us with certainty that, if it reaches us with reasonable promptness, it will continue to live. I believe that the closer connection with Buitenzorg scientists and offices which I expect to result from my trip, will be worth more to this college, wihtin a year or two, than the trip has cost me.

Aside from the material results of the trip, it has been impossible for me, with eleven years experience in the Philippines, and a developed interest in governmental problems, procedures, and accomplishment, and in the social and economic conditions of the people, to spend even a few days in Java, where the same problems have confronted the Government and the fundamental interests of the people are the same, without accumulating a very large amount of information, and very many ideas which should be of value in the Philippines if they can be applied.

As to governmental organization, it is recalled that, acting on the initiative of the Honorable, the Secretary of Public Instruction, I presented last Fall a plan of organization which should concentrate under one office all of the activities of the Philippine Government which aim directly at the development of the economic welfare of the Filipino people. In my ignorance, I did not support this plan with the weight of the example of the government which has worked out the same problems under conditions most exactly resembling those in our own islands, and which, among the colonial governments in the world, is most conspicuously successful in the accomplishment of results in this field. Under the Javanese system, agriculture, industry, and technical education are collected under one head. This head, it is true, is a Chief of the Department. His position, however, does not correspond to that of our Secretary of a department because he is not a member of the Council of the Indies, the body which, in its functions, corresponds most nearly to the Philippine Commission. The Director of the Javanese Department occupies a position corresponding to that of Chief of one of our bureaus. His place is more important than that of one of our bureau chiefs, just as the Dutch Indies are greater than the Philippines. While education in all technical matters, except Medicine, is a part of the

work of the Javanese Department of Agriculture, it is impossiple, because of the inferior general development of education in Java, that technical education should have there the central position which I proposed for it in the Philippine organization. That this is a handicap of the Javanese Department was fully recognized by every official with whom I discussed the subject. When this question comes up for discussion again in the Philippines, as it inevitably will come up because the present organization is too defective and has been too unsatisfactory in its results, I hope that attention will be given to the fact that the best precedent which could possibly be adduced supports my proposition as completely as it is possible for it to do. No man who can compare the results which have been attained in Java by the concentration of all efforts toward industrial development in a single office, and those which have been attained in the Philippines by the divided work of several offices, will need much additional argument to show him which plan is the better one.

Leaving aims out of account for the moment, and taking up methods and results, the Dutch Government of Java is distinguished from the American Government of the Philippines by the attention which the Dutch Government and people at home have given to the subject, the careful attention which they have given to all its details. The American Government over the Philippines has been exercised in a very general way by a Congress, the members of which, with rare exceptions, have been obliged to work without personal knowledge of the conditions and problems of the people for whom they were legislating. The Congress has accordingly restricted itself, as a general policy, to action which might be based on fundamental principles. The details of administration, so far as it has been considered necessary for those to be settled by Americans, have been entrusted by the American Government to a Governor-General and Commission, appointed by the President. Appointments to these positions have, almost without exception, been given to men without previous personal knowledge of the particular problems they would be obliged to meet and settle, and the tenure of office has been uncertain and, on the whole, brief. In my first ten years in these islands, I served under six Governors-General. The Governor-General of the Dutch Indies has definite appointment for five years, and in case that conditions are in any respect critical, is continued in office. The present Governor-General, for instance, is now holding over because political conditions in the world at large are regarded as making any change undesirable.

The Philippine Governor-General and Commission in turn have been dependent for their work here upon bureau chiefs, each with a large corps of subordinates. These men have been chosen from the United States with a certain formal regard to previous general education, but in the vast majority of cases, without any possibility of their having had any previuos training for the particular work which they were to perform here. More than this, the average term of service in the islands has been so brief that, if the men did the best that they could and put their whole efforts into their work, their time has been largely taken up with preparing themselves to be really efficient.

The Dutch system has been as far from ours as the North Pole from the South Pole. In the particular case of agriculture, for instance, there is maintained in Holland a school of Indian Agriculture of collegiate grade, and in this school, two hundred young Ducthmen are being technically trained for this branch of the colonial service. Tropical agriculture can at best be taught imperfectly in Holland, and the graduates of the home school accordingly begin their colonial service as apprentices. With such a difference in the preparation of the men entering the service, it is hardly to be wondered at that Dutch work in tropical agriculture and American work in the Philippines have seemed hardly to be work on the same subject. Again, no Dutchman enters any branch of the East Indian service without a general home training, including a most careful study of the colonial economic, social, and political conditions, and without a training in at least two of the native languages so thorough that they are read, written and spoken with a considerable measure of fluency before he leaves Holland. What a difference it would make in our work if every American coming to these islands had a fluent use of Spanish and one of the Filipino tongues, before his arrival!

American policy in the Philippines was to establish a Government by Americans aided by Filipinos, and to develop from this a Government by Filipinos aided by Americans, with the ultimate idea that there should be a Government by Filipinos alone. Leaving the ultimate end, which has not yet been reached, out of account, the scheme is one of coöperation, which, for success, must depend upon the joint efforts of the Filipinos and the Americans. The success of these efforts, so far as each individual is concerned, depends partly upon his natural

ability, something which it is always very hard to control or to measure, and partly upon his training, something which can be controlled and appraised almost in its entirety. To the training of the Filipino, we have given the most careful possible attention. To the training of the American, we have given absolutely no home attention. To use an agricultural figure, we have selected our annual crop of American appointees to the Philippine service from the general field, but we have never taken the trouble to cultivate or even to plant the field from which this crop was to be selected. So far as training for the service is concerned, the crop we have harvested is very much the same which the corn grower would harvest from a farm where no seed had been planted.

Without home training, there remained the chance that the selection from the home field would be successful enough as regards natural ability so that the Government officials and employees could gèt training with experience in the Philippines, and thus finally, even if by no means immediately, do their part with full satisfaction. To a considerable extent, the chance of success in this way has been realized here; but against the possibility of the realization of any such measure of success as was possible in this way, there has always operated the short average tenure of office, due both to doubt as to the stability of local institutions, and the absence of inducement to make the Philippine service a life work. No Dutchman enters the Indian service with the slightest doubt that it is to be the work of his whole active life. The home training itself is a guarantee of this expectation, and a system of pensions on retirement furnishes insurance against any subsequent change of purpose. A pension system in the Philippine service has been discussed repeatedly, but no such plan has ever been adopted. Inasmuch as appointments to the Philippine service have been made without selection on the basis of the particular preparation of the appointees for their work, and in the absence of a very rigid system of weeding out the employees who do not subsequently demonstrate that they have effectively trained themselves in the service, a pension system in the Philippines would very possibly result in keeping in the service very many men whose service is not quite unsatisfactory, but likewise not valuable enough to make it really worth while to encourage them to remain permanently. It was once proposed in Congress to obviate this difficulty by pensioning only those who had been ten years in the service with salary of at least ₱6000. Aside rom the fact that the proposed term of service was too short, the proposed minimum salary for eligibility to pension was altogether a mistake. There are no branches of our service in which ample local experience, depending itself upon long service, is more essential for efficiency than among the school teachers and constabulary officers. In both of these lines, there should be an inducement sufficient to retain the most competent men for a period of as much as twenty years; but in neither of these branches would it be possible, if all the thoroughly competent men were retained, for any considerable part of them to reach a salary as high as that proposed. Neither is so high a salary needed for the purpose. Very many of the teachers who enter our service at $1200 and work up to perhaps $1600 by a number of years of thoroughly satisfactory service, and then resign to begin anew on something which may be their life-work in the United States, would be glad to remain here if they knew that they could do so for a total period of twenty years, and then retire with a reasonable pension. The present system has a double disadvantage. Not merely are we continually losing teachers and other employees whom we would be glad to keep, but to whom the annual salary alone cannot be made a sufficient inducement, but we are also continually obliged to fill these places by fresh appointees, who may, if we are fortunate, repeat the same record, but who too frequently never prove that they are really fitted at all for their work here.

The old servant of the Dutch colonial Government cannot be dragged out of his place. I recall that years ago, our Director of Forestry undertook to secure the services of one of the Dutch colonial foresters whose work would have been most valuable in the organization of work here. This man had at the time about sixteen years' experience, a considerable part of it as near to the Philippines as Northern Celebes. At a time when our foresters hardly knew the name or the use or the characteristics of any tree in the Philippine forests, the Dutchman's assistance would have been valuable indeed, and the inducement offered him was commensurate with his prospective value. Moreover, he happened at the time to be thoroughly dissatisfied with the particular conditions he has working under in Java. His reply was that the salary and the work which were offered him were altogether to his taste, and that he was very grateful for the compliment of the offer; but that he hoped to enjoy old age, and that no present salary or opportunity could induce him to

sacrifice the pension upon which he depended for the opportunity to enjoy it.

It is too late for us, if it ever may have been possible, to think of thorough home training for Americans in the Philippine service. It is not, however, too late to devise a pension system which, without undue expense to the Government, but in the real interests of the Government's economy, will in a reasonable measure insure to the Government the long use of the training which Americans receive after they come here. In my opinion, some kind of pension system should be a feature of every civil service; but for a colonial civil service, it is especially necessary.

As to the aims of the Dutch Indian Government and the Philippine Government, it has been pointed out that these are most fundamentally identical, that is, that both are in avowal, and so far as they are able to realize their aims, in every detail of their practice, carried on in the interest of the several peoples of the general archipelago. In less ultimate aims, however, the two differ very materially. From the Dutch point of view, the situation could better be expressed by saying that the American Government has turned somewhat away from the service of the interests of the people in its attempt to secure the establishment of a native state. One of the real distinctions in method between the two countries certainly is that the American Government has given a great deal of attention, and has allowed the Filipino a great deal of liberty, in the training of the native for self-government. The Dutch, on the other hand, in their coöperation with the native in the administration of governmental affairs, have given the native the form of authority in provincial and local affairs in as high a measure as has been done in the Philippines, but have taken great care not to let the form carry with it the substance. Thus, the provinces or regencies are administered each by a Regent, who is a native Javanese of high social rank, and maintains a respectable court. The Regent issues all orders to subordinate officials, and so exercises to the full the form of being the local chief of state. But attached to each Regent is a Resident, or perhaps only an Assistant Resident, and he has the function of telling the Regent what orders may be issued. Even in the two Javanese states where there are still native Sultans, each with a huge court, the administration of Government is in essentials not very different from that in other parts of the island. There is a constant movement in Java toward the better training of the Javanese for effective local Government, and a disposition to increase the authority of native officials, at least the minor ones, as fast as the Dutch believe that this can be done safely. But progress in this direction is decidedly slow in Java, if measured by Philippine standards. In these matters, there is little chance that the Dutch will learn anything from the Philippines, or that the Philippine Government will learn anything from the administration of Java.

Another difference between the work of the two Governments which is associated with the difference in immediate aims, is found in the different activities by which they are characterized. Both maintain the general features of all governments, attending to the preservation of peace and health, the administration of justice, and the collection of the necessary revenues. Beyond the general governmental activities, the American Government is characterized, in distinction to every other colonial Government in the world, by the very great attention it has given to public education. In contrast to this, the outstanding activity of the Dutch Government in Java has been the direct promotion of the economic welfare of the Javanese people. If one may presume to judge the results of these two systems, the conclusion must probably be that each Government has unreasonably and unfortunately neglected the phase of activity which the other has most emphasized. In Java, the time has come when the absence, not so much of a generally educated population as merely of a large educated class, interferes decidedly with the accomplishment of work which would be easy if the Javanese were better trained to coöperate with the Dutch. In the Philippines, we have neglected economic development until the ability of the people to furnish the means for the support of as active a Government as we have established, and to continue along the course of political development upon which they have entered, is open to very serious question. Both plans have of course resulted in the development of strength. The economic soundness of Java will make it possible to develop such an educational system as the country needs, and the general education of the Filipino may facilitate more rapid economic development than would be possible without it. Nevertheless, a more symmetrical development would probably have been better in both regions, and both have difficulties still to face as a result of one-sided development.

Critics of the Dutch colonial administration have claimed that Dutch policy places material before social interests, exports before domestic uses of products, the land and its fruit before the people. This may have been true

in the past, but certainly is not so now. Care certainly is given to the land. If the land is to serve such a population as it is made to do in Java, amounting in some districts to more than seven hundred to the square kilometer, care must be given to it. The land in Java is made to serve the people of Java, and is restricted to the service of the people of Java to an extent which we do not in the least approach in the Philippines. The Government does not interfere with the fullness of property rights where such private rights are in existence; but ownership of this kind can no longer be acquired, and the lands which are so held are insignificant in area compared with the size of the island. With the exception of such holdings, not a foot of land in Java can be sold to a foreigner,—not even to a Dutchman. We follow a policy of "the Philippines for the Filipinos" and have made it rather conspicuous as a political policy, but as an economic policy it is decidedly feebly developed as compared with the Dutch policy of Java for the Javanese.

I have already explained the skillful and successful manner in which the government authority over the land is used to persuade the native tea grower to reap more benefit from it than he would be able to do by his own training or on his own initiative. The sugar industry furnishes an equally striking example of the Dutch policy, exercised in a very different manner. Of all branches of agriculture, sugar is conspicuous for its dependence on the investment of very large capital. The price of the world's sugar is subject to independent political manipulation, in a number of countries, by the imposition of duties and the granting of bounties and rebates. The effect of this situation is that the sugar industry, requiring the investment of great capital, is unable to secure this capital without the danger that prices will be made to fluctuate in a manner to which most other crops are not exposed; and this in turn has the result that money is only invested in sugar in the expectation of larger returns than are called for by the capital invested in most other business. In the cane sugar business these very large returns are, in the tropics, secured by the use of very cheap labor. Because of the very large units in which capital is found in this business, and of its insistence upon cheap labor, there is usually developed in connection with the sugar industry an economic and social condition entitled to no better name than serfdom. The people who have compared the Hawaiian Islands with the Philippines to our disadvantage, merely because Hawaii has great exports from a small area, and perhaps because the concentration of wealth has made Honolulu a beautiful town, either do not know whereof they speak, or they value exports above men. Sugar has become a very necessary article, but the production of sugar where I have seen it is a curse to the country. Even in the Philippines, the regions where sugar is best developed and in which we find the finest haciendas have the most hopeless social conditions. Sugar in Java is confined to a rather small area in the East end of the island, but its production here is intensive enough to give Java a foremost place among all sugar producing lands. In most striking distinction to other cane producing countries, Java produces sugar without the horrible social conditions which are associated with the sugar business elsewhere. This is accomplished again by the Government's control over the land. The sugar company is given a long-term lease of just enough land for its factory and other necessary buildings. The surrounding land is occupied, usually in small holdings, by natives who hold it under the Government's restrictions. The factory rents each year enough land to produce its crop. The same land cannot be leased for successive crops, but must be returned to the individual natives, who then use it for the production of their own crops, usually their food. In this way the Government provides a rotation of crops on the land and so prevents its exhaustion. At the same time it accomplishes a vastly more important service, by preserving to the native his status of a land-holder, and preventing the possibility of his becoming the serf or slave of the sugar company.

Sugar companies elsewhere would doubtless claim that business would be impossible under such conditions. But they do succeed under these conditions in Java, where sugar is produced by the million tons and exported even to the United States where Hawaiian sugar is free, and Cuban sugar half free, but Javanese sugar has had to pay the full duty. As sugar production in the tropics is sure to increase, and as the Philippines hope to share in this increase, but certainly do not want the social conditions of Hawaii, or even of Negros, to become the rule in these islands, a study of the Javanese methods of control is earnestly recommended to our Government.

A really basic comparison of Government and the success of Government in Java and the Philippines would have to be based on the welfare and happiness of the people. Welfare is most often and most completely measured in terms of wealth. I do not know what may be the average wealth per capita in either land, but presume that it is higher in the Philippines. Speaking of the part of Java which I saw, and

leaving out of account the occasional vast plantations which are relics of former time, I feel sure that wealth is more evenly distributed among the Javanese people than among the Filipinos, and that poverty is less acute than it is in many parts of the Philippines. Since Java is perhaps eight times as densely populated as the Philippines, this would be a most astounding condition if everywhere true. It is my understanding that it is not the case in the Sultanates of Soerakarta and Djokjakarta, where the form of native government still suffices to keep the Dutch from fully protecting the common Javanese against the native aristocrat. I understand too that in some very densely populated parts of Java, poverty is decidedly real, but that the condition of the people as a whole is so uniform that there is little contrast of rich and poor, or strong and weak, and the absence of contrast keeps the sting of poverty from being felt. A high standard of living is obviously impossible where a square kilometer of land must support seven hundred people. That they can live at all is testimonial enough to the industry of the people, and the genius of the government.

The absence of waste in Java, resulting from the disuse of land, the poor use of land, the misuse of products or the needless destruction of any kind of wealth, is conspicuous and of course contributes to the welfare of the people. In a country where, for any reason, population reaches such a density as it has now reached in Java, natural selection by itself will go a long way toward the prevention of waste. This is demonstrated, for instance, by China. But the Javanese Government has interested itself directly in this kind of problems. I have already explained sufficiently its care for the best use of the land, as the ultimate source of all native wealth. It cares in the same way for water and acts with apparent disregard of immediate cost in providing the widest possible distribution of the water necessary for the native's staple food. The losses due to poor communication, which are so severe a drain on Philippine agriculture, are guarded against in Java by a railway system largely owned by the Government, a system of public roads forming a fine network over the whole island, and kept in perfect condition in spite of the tremendous rainfall, and a very large inter-island commercial fleet under the royal patronage and strict governmental supervision.

The loss of buildings in the Philippines due to insects, decay and fire, is a very heavy annual drain on the wealth of the country. The loss of this kind in Java is comparatively insignificant. I saw no houses of native Javanese as fine as some to be found in almost any town in the Philippines, but I saw no people so badly housed as are many in every Filipino town. One reason for this which has already been mentioned is the extensive use of teak as a structural timber. A still more important one is the almost universal use of tile roofs. Even in the little kampongs far from the main roads and towns, the most of the little houses have these roofs of red tile. The tile in use is much lighter in weight than I have ever seen in the Philippines, and so requires a lighter and cheaper supporting structure, but is said to be exceedingly durable as compared with a roof of any other kind. The general use of these tile roofs and the consequent loss of waste and gain in comfort impressed me so strongly that I believe there is no other single thing which Philippine industry could borrow from Javanese with so great profit. Still the Dutch Government is not content with the situation, and supplementing the attention which had already been given locally to the tile industry, it has, during the past year, brought from Europe a technical specialist who is now devoting himself to means of manufacturing more and better and cheaper tiles. I would recommend very strongly that the tile business of Java be investigated by some person technically competent, and that steps be taken without delay looking to the widespread development of the same industry in our islands.

The happiness of a people is something very hard to appraise. Happiness has very many factors, and the most of these are themselves quite intangible. One of them is pride. Pride may lead to unreasonable hope and to disappointment, but if confined to what has been accomplished and to the work of to-day, it is a very important constituent of real happiness. While some of the pride of the Filipino is of the mistaken kind which leads to discontent, I believe that there is in these islands considerably more of the reasonable pride in past accomplishment and present condition than is to be found among the Javanese.

But contentment is another and still more important component of happiness, and I doubt there being a people on earth much more contented than the Javanese. One reason for this is their religion. Another is that they are too busy to think about their troubles; and still a third is perhaps the fact that they are not sufficiently educated to see reasons for not being contented. People sometimes undertake to classify happiness, to distinguish higher and lower forms or phases of it, the higher phases being dependent upon intellectual development

and the training of power of appreciation. I do not know much about the soundness of such classification, but have observed that the attempt is always made by those who succeed in assigning the higher forms of happiness to themselves and their own people. I know, too, that the training which is calculated to produce an appreciation of our blessings often results in practice in appreciation of the blessings which we do not have, and therefore in a sense of discontent; for this reason, I am somewhat skeptical about the value of most intellectual training as a producer of happiness. I do know, too, that the discontent which results from education results in effort, and in progress of a variety of kinds. For this reason, I would anticipate that the absence of general discontent with economic and social conditions in Java would result in a cessation of progress if Dutch control were withdrawn, while the general discontent with existing conditions which is one of the fruits of our educational success in these islands, would be very likely to result in a continued and rather rapid economic and social development of some kind or other if the Filipino people were left to themselves. So far, however, as happiness itself is concerned, I cannot help believing that the relative absence of discontent in Java gives the Javanese people at the present time a very distinct, even if perhaps temporary, advantage over the Filipino people.

Finally, the most natural, fundamental, certain and complete happiness is that which the parents find in their children. The successful rearing of a family brings happiness which nothing else can take away. The rapid increase in the Javanese population testifies to the abundance of parental happiness there.

If, therefore, a judgment were to be made by present conditions, and the success of Government to be gauged by the happiness of the people governed, I must believe that the Dutch East Indian Government is not merely to be regarded as successful, but as having achieved the most perfect success which I have ever seen under conditions in any respect comparable.

The third volume of the PHILIPPINE AGRICULTURIST AMD FORESTER has just been completed, and the public is invited to judge it. Four years ago, this magazine was alone in the World, in its field, the only attempt of a body of students to publish a magazine of technical agriculture. The students of the Nebraska and Wisconsin agricultural colleges have since undertaken the publication of less technical papers; and last year the students of the California college entered our field.

The student body which publishes the Agriculturist and Forester is probably poorer in money than any other under the American flag; but it has done this work without subsidy from University or Government. Because it could not support several publications, it has given up its college annual, and, if necessary, will abstain from participation in the university annual for the same reason. At any sacrifice, it will continue to publish its technical magazine; it will enlarge this and publish a larger edition for the coming year; and it expects the quality to be improved. The editor and business manager propose that, as a rule, future numbers shall contain thirty-six pages of reading matter, instead of the twenty-four usual in the past; and the edition is to be one thousand copies, instead of seven hundred.

The faculty of the college is proud of the student body for its success with this magazine; and the Filipino people may well join in this pride.

E. B. C.